

## H13- Technical Data

### General Description:

H13 is the most popular, and perhaps most versatile, hot work tool steel, providing a good balance of toughness, heat check resistance, and high temperature strength, in addition to moderate wear resistance. It may be used for tool temperatures up to about 1000 °F, with brief exposures up to 1100 °F.

### Example of applications:

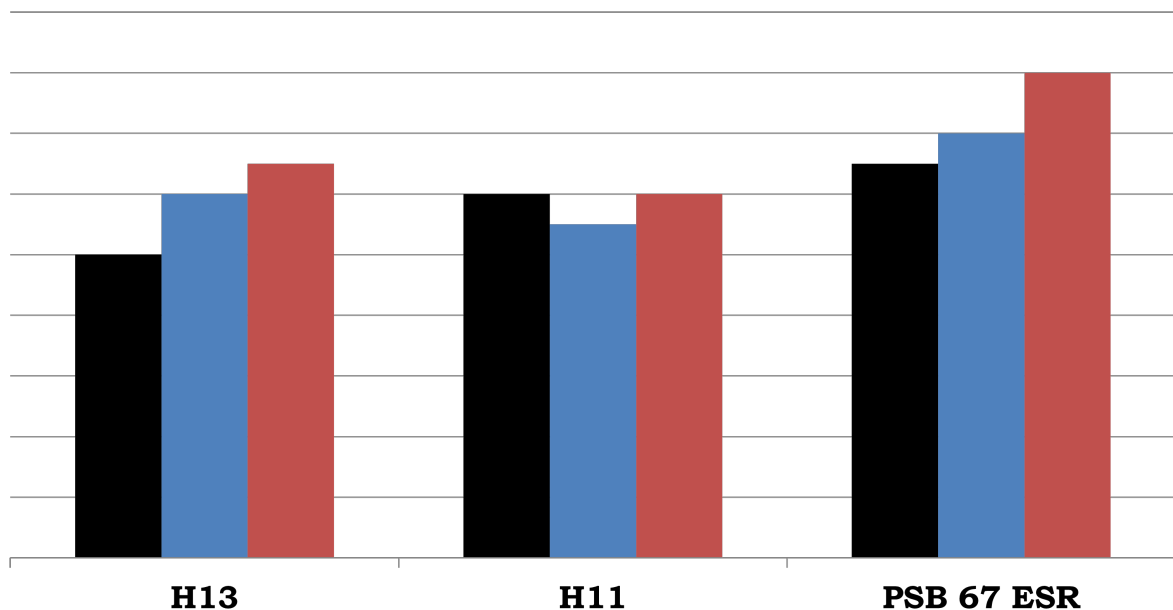
Extrusion tooling, die casting dies, bolsters, die inserts, dummy blocks, shot sleeves/plungers, mandrels, plastic molds, forging dies, core pins, hot upset dies, ejector pins.

### Chemical Composition

Carbon	Molybdenum	Vanadium	Chromium	Silicon	Manganese
0.37-0.45%	1.10 - 1.75%	0.80 - 1.20%	4.75 - 5.50%	0.80 - 1.25%	0.20 - 0.60%

### Comparison Chart

■ Toughness ■ High Temperature Wear Resistance ■ Temper Resistance



### Typical Heat Treat Response

Hardening Temp °F	Tempering Temp °F	Hardness HRC	Charpy V-Notch Toughness - ft.-lbs
1850	1000	52	10
	1050	50	10
	1100	47	18
	1125	41	18

### Size Changes During Hardening

Hardening Temp °F	Tempering Temp °F	HRC	Longitudinal Size Change %
1850	1000	52	0.07%
	1100	47	0.08%

### Surface Treatment

Because of its high tempering temperatures, H13 may be treated by most surface treating processes, including conventional and ion nitriding, titanium nitriding, and other coatings or treatments. Nitrided surface hardness will be about 60/65 HRC.



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### Heat Treatment

#### Annealing

Heat to 1600 °F. Hold two hours at temperature.  
Cool slowly (25°F/hour maximum) to 1200°F, then air cool to room temperature.  
Typical annealed hardness: 192-235 BHN.

#### Stress Relieving

Performed after rough machining to minimize distortion in heat treating.  
1200/1250°F, hold two hours at temperature, then air cool to room temperature.

#### Hardening

Protective atmosphere, or vacuum furnace equipment preferred.

#### High Heat (Austenitizing)

1825/1875 °F, hold for 30-45 minutes at temperature.

#### Quench

Vacuum or atmosphere quench rate of a minimum 25 °F/minute down to 1200 °F is critical to achieve best heat treat response. Then air cool to room temperature.

Temper immediately following quench.

#### Tempering

Minimum 1000°F tempering temperature required. Two hours at tempering temperature.  
Double tempering is require, triple tempering recommended.  
Air cool to room temperature between tempers.

### Physical Properties

<b>Modulus of Elasticity</b>	30 PSI x 10 <sup>6</sup> .....(207 GPa)	<b>Density</b>	0.283 lb/In <sup>3</sup>
<b>Annealed Hardness</b>	192/235 Brinell Hardness (BHN)	<b>Machinability</b>	70% of O1